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स्पलाइन और सेरेशन हाब — तकनीकी आपूर्ति की शर्तें

Indian Standard

SPLINE AND SERRATION HOBS — TECHNICAL SUPPLY CONDITIONS

ICS 25.100.20

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1998

Price Group 3

Milling Cutters, Saws, Gear Cutting Tools and Broaches Sectional Committee, PE 11

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Mining Cutters, Saws, Gear Cutting Tools and Broaches Sectional Committee had been approved by the Production Engineering Division Council.

Splines and serrations are multiple keys used to prevent relative rotation between shafts and members mounted on them. These hobs are meant for generating the profile for splines and serrations.

Some requirements of IS 10608 : 1983 'Specification for straight sided spline hobs' have now been covered in this standard and rest in its revised version mentioned below:

IS 10608 : 1998	Spline hob — Straight sided — Specification *(first revision)*
IS 14585 : 1998	Spline hobs—Involute sided — Specification
IS 14586 : 1998	Serration hobs — Straight sided — Specification

Other standards in this series are:

IS 8731 :1978	Technical supply conditions for general purpose gear hobs
IS 8732 : 1978	Single start gear hobs with axial key way .
IS 8733 : 1978	Tolerances for single start gear hobs

This standard is based on the practices followed in the industry.

Indian Standard

SPLINE AND SERRATION HOBS — TECHNICAL SUPPLY CONDITIONS

1 SCOPE

This standard covers the terminology, material and other requirements.for spline and serration hobs.

2 REFERENCES

The following Indian Standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the[1] standards indicated below:

IS No.	*Title*
2327 :1993	Straight sided splines for cylindrical shafts with internal centering — Dimensions, tolerances and verifications *(first revision)*
2610: 1989	Power transmission — Straight sided splines for machine tools — Dimensions *(first revision)*
3654 : 1966	Dimensions for straight sided serrations
3665 : 1996	Dimensions for involute sided splines
6285 : 1971	Dimensions for interchangeability of milling cutters and milling arbors with key drive
7291 : 1981	High speed tool steels (*first revision)*
7778 : 1975	Methods for sampling small tools
10097 : 1982	Code of practice for the packaging of metal cutting tools

3.1 Spline hob for straight sided splines *(see* Fig. 1).

3.2 Spline hob for involute sided splines *(see* Fig. 2).

3.3 Serration hob for straight sided serrations *(see* Fig. 3).

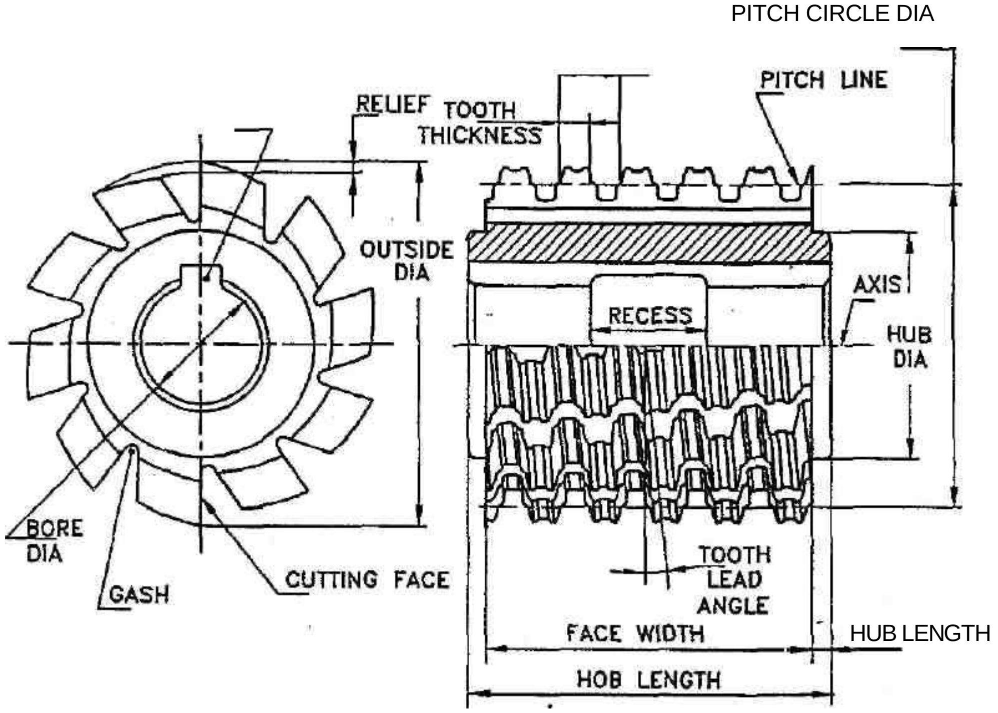


FIG. 1 SPLINE HOB FOR STRAIGHT SIDED SPLINES

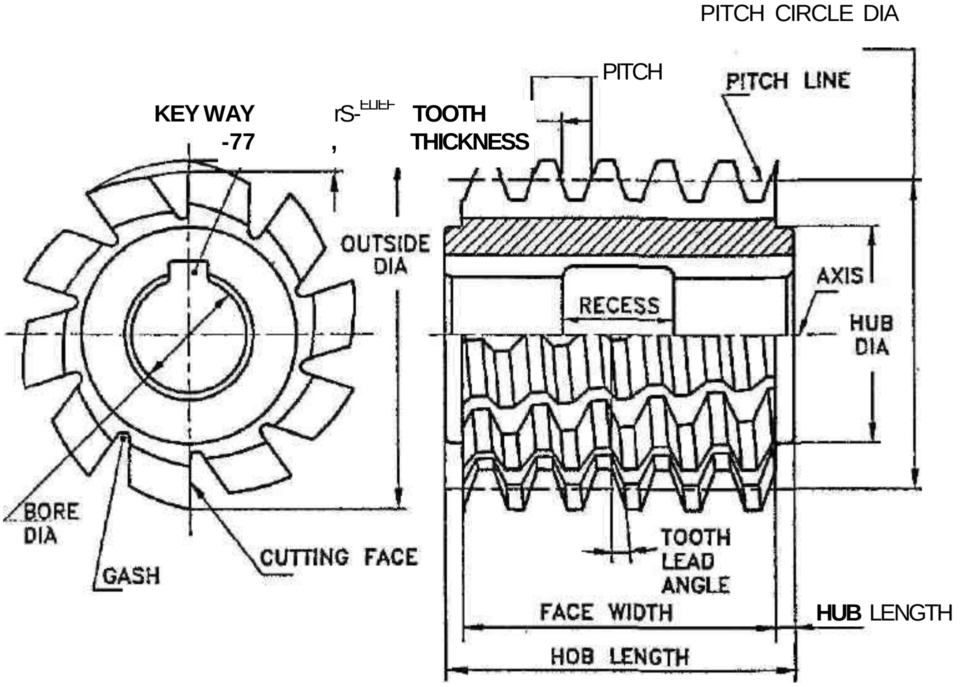


FIG. 2 SPLINE HOB FOR INVOLUTE SIDED SPLINES

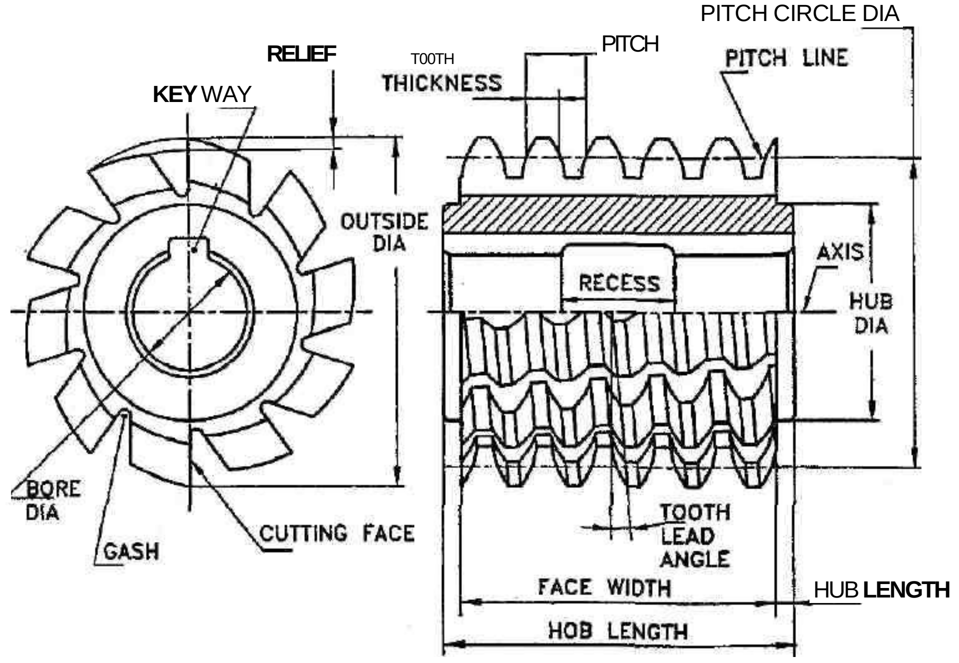


FIG. 3 SERRATION HOB FOR STRAIGHT SIDED SERRATIONS

4 TERMINOLOGY

4.1 Hob

The hob is a multi-point generating rotary cutting tool, cylindrical in shape and resembles a worm in appearance having teeth, created by number of gashes on its periphery following a helical path like a worm thread. In hobbing method, both the hob and the work blank revolve continuously in timed relation, the tooth being generated by the hob as it gradually feeds along or into the work blank.

4.2 Elements of Spline and Serration Hobs

4.2.1 *Axis*

The longitudinal centre line of the hob.

4.2.2 *Tooth Lead Angle*

The angle subtended by the tooth helix with a plane normal to axis of the hob.

4.2.3 *Angle of Gashing*

The angle subtended between the leading edge (cutting edge) and the hob axis.

4.2.4 *Outside Diameter*

The outside diameter is the diametral measurement over the crest of the teeth of the cutting edge, also the maximum diameter of the hob.

4.2.5 *Pitch Circle Diameter*

The pitch circle diameter is the diameter of an imaginary co-axial cylinder, at which normal tooth thickness is equal to circular tooth space widthof the component at its generating diameter.

4.2.6 *Hub Diameter*

The diametral measurement of the hub.

4.2.7 *Bore Diameter*

Diametral measurement of the bore of a hob.

4.2.8 *Hob Length*

The axial length over the extreme ends of the hob.

4.2.9 *Pitch Line*

The pitch line is an imaginary line at which normal tooth thickness is equal to circular space width of the component.

4.2.10 *Hub Length*

The axial length of the hub.

4.2.11 *Pitch*

The distance between corresponding points on adjacent teeth.

4.2.12 *Axial Pitch*

The distance measured parallel to hob axis, between corresponding points on adjacent teeth in the same axial plane.

4.2.13 *Normal Pitch*

The distance measured normal to lead helix, between corresponding points on adjacent teeth on a plane normal to thread helix.

4.2.14 *Cutting Length* The

toothed length of hob.

4.2.15 *Straight Gashing (Axial Gashing)*

The gashing of tooth parallel to the axis.

4.2.16 *Helical Gashing (Spiral Gashing)*

The gashing to tooth perpendicular to lead angle.

4.2.17 *Face Width*

It is equal to hob length minus twice the hub length.

4.2.18 *Pressure Angle*

The angle subtended by the flank of hob tooth and an imaginary radial line normal to axis of hob, in an axial plane.

4.2.19 *Setting Angle for Hobbing*

This is equal to lead angle of hob thread, while hobbing spur gears/splines.

4.2.20 *Module*

Ratio of pitch diameter to the number of teeth.

4.2.21 *Gash Lead*

Helical lead of gash.

4.2.22 *Tip Radius*

Crest radius of hob tooth profile,

4.2.23 *Accuracy Grade*

Accuracy of hob geometry is graded as precision ground profile and accurate ground or precision unground profile.

5 BASIC PROFILE OF SPLINE AND SERRATION HOBS

5.1 Basic Profile for Straight Sided Spline Hobs

This profile is to generate straight sided splines which are covered under IS 2327 and IS 2610. Definition of terms shall be given as below *(see* Fig. 4).

5.1.1 *Pitch*

The distance between corresponding points on adjacent teeth. Pitch of basic profile will be equal to normal pitch of hob.

5.1.2 *Tooth Thickness at Pitch Line*

The length between flanks of the tooth at the pitch line.

5.1.3 *Addendum*

Height of the tooth above pitch line.

5.1.4 *Semitopping Height*

Height of the tooth above ramp in the tooth profile. This ramp generates chamfer on splines at the tip of component.

5.1.5 *Semitopping Angle*

The angle subtended by ramp and the perpendicular line to pitch line.

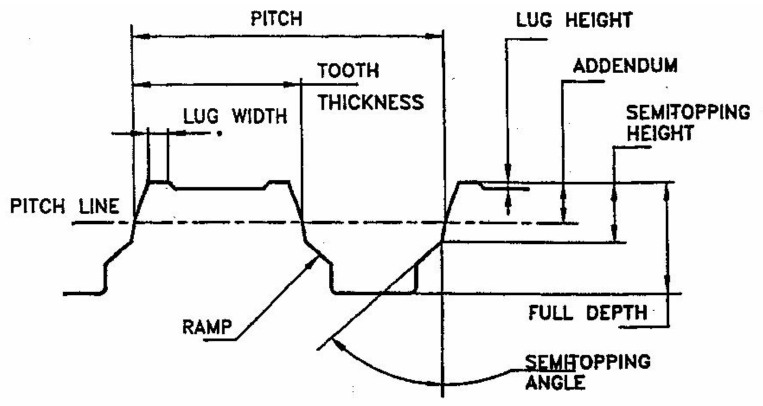


FIG. 4 BASIC PROFILE FOR STRAIGHT SIDED SPLINE HOBS

5.1.6 *Full Depth*

The total radial depth of tooth face.

5.1.7 *Lug*

It is a pip on top of the basic tooth profile. This lug generates groove in minor dia of spline.

5.1.8 *Lug Width*

Tip width of the lug.

5.1.9 *Ramp*

Semi-topping profile to generate tip chamfer on spline/gear.

5.1.10 *Dedendum*

The depth of the tooth space below the pitch circle or the radial distance between the pitch circle and the bottom of the tooth space.

5.2 Basic Profile for Involute Sided Splines

This profile is to generate involute sided splines. Dimensions are covered under IS 3665.

5.2.1 Basic 'Profile-F for side fit involute splines *(see* Fig. 5).

5.2.2 Basic 'Profile-IT for major diameter fit involute splines *(see* Fig. 6).

5.2.3 Basic *Profile-IIF for minor diameter fit involute splines *(see* Fig. 7).

5.3 Basic Profile for Serration

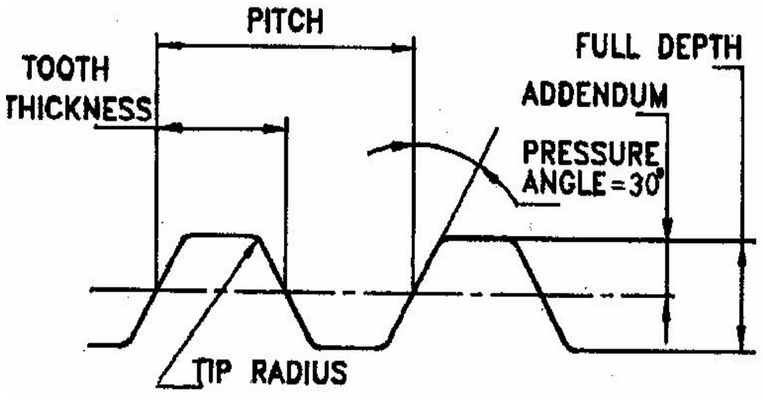
Basic 'Profile-F is to generate straight sided serrations covered under IS 3654. When serration pitch is less than 3.00 mm (that is from serration size 7 mm x 8 mm to 30 mm x 34 mm), then it is difficult to manufacture suitable hob with basic 'Profile-F. In such cases basic 'Profile-IF may be followed. This will generate involute serrations and the generated profile will be very close to straight sided serrations. To supply and use such hobs are subject to agreement between the user and the tool supplier.

5.3.1 *Basic Profde-1* — to generate straight sided serration *(see* Fig. 8).

5.3.2 *Basic Profile-II* - to generate involute sided serrations *(see* Fig. 9).

6 MATERIAL AND HARDNESS

6.1 Spline hobs shall be made ofhigh speed tool steel according to designation T90W6CoMo5Cr4V2 of IS 7291 or equivalent as agreed by the users and manufacturer.



ADDENDUM = h_{kw} = 0.6 m

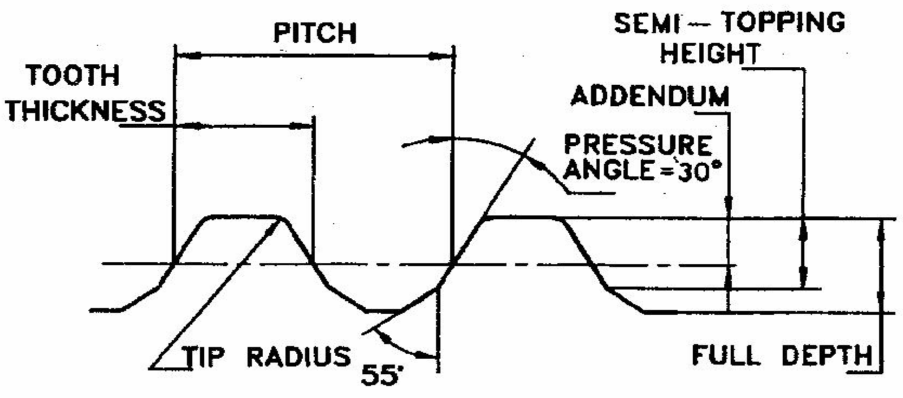
FULL DEPTH = h_w = 1.2 m

TIP RADIUS = r_1 = 0.16 m

PITCH = p = m

TOOTH THICKNESS = T = $\frac{\pi m}{2}$

FIG. 5 BASIC PROFILE-1 FOR SIDE FIT INVOLUTE SPLINES



ADDENDUM = h_{kw} = 0.6 m

FULL DEPTH = h_w = 1.2 m

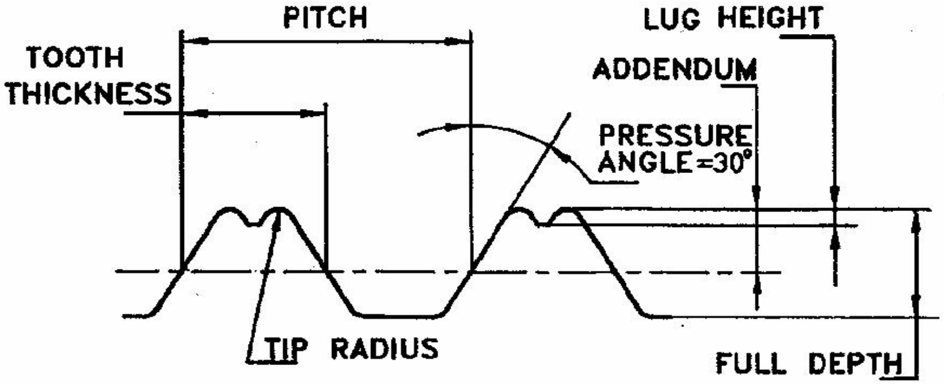
TIP RADIUS = r_1 = 0.16 m

PITCH = p = m

TOOTH THICKNESS = T = $\frac{\pi m}{2}$

SEMI — TOPPING HEIGHT = h_s = DEPEND ON No. OF SPLINES AND TIP CHAMFER

FIG. 6 BASIC PROFILE-II FOR MAJOR DIAMETER FIT INVOLUTE SPLINES



ADDENDUM = h_{kw} = 0.6 m

FULL DEPTH = h_w = 1.2 m

TIP RADIUS = r_1 = 0.16 m

PITCH = p = m

TOOTH THICKNESS = T = $\frac{\pi m}{2}$

LUG HEIGHT = h_L = 0.2 m

FIG. 7 BASIC PROFILE-III FOR MINOR DIAMETER FIT INVOLUTE SPLINES

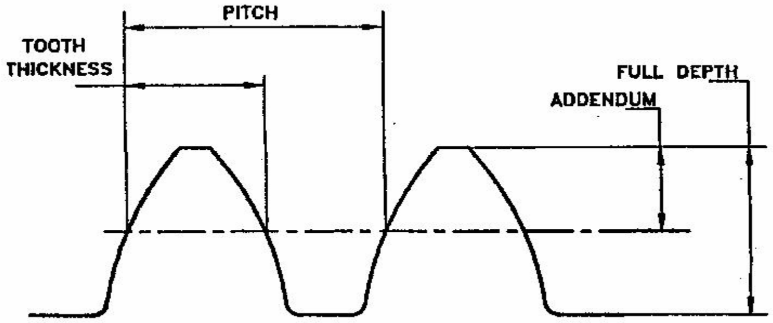


FIG. 8 BASIC PROFILE-I FOR STRAIGHT SIDED SERRATIONS

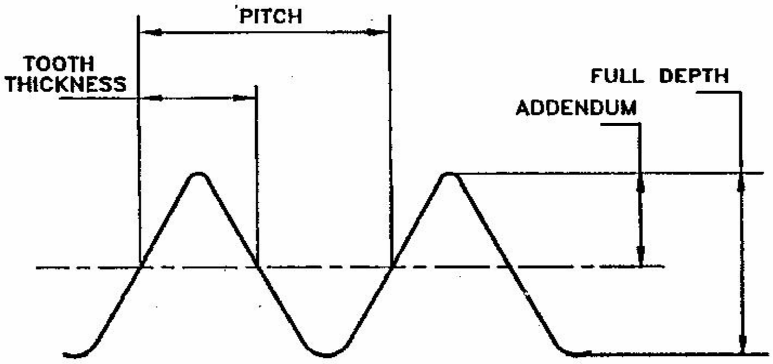


FIG. 9 BASIC PROFILE-II FOR INVOLUTE SIDED SERRATIONS

6.2 Hardness of spline hobs shall be between 820 to 900 HV measured at flat face.

7 GENERAL REQUIREMENTS

7.1 Dimensions for keyway shall be according to IS 6285**.**

7.2 Unless otherwise specified, the hobs shall be supplied with single start and right hand thread.

7.3 All sharp corners except cutting edges shall be removed.

7.4 Incomplete teeth shall be rounded off. Crest thickness of incomplete teeth of hobs shall not be less than half the thickness of the crest of complete teeth**.**

8 WORKMANSHIP AND FINISH

8.1 Spline hobs shall be free from defects like burrs, seams, rust, cracks or any other manufacturing defects.

8.2 Each spline hob shall be coated with rust proof coating and wrapped in non-absorbent paper.

9 SAMPLING

The sampling and criteria of acceptance shall be according to IS 7778.

10 MARKING

Spline and serration hobs shall be marked with the following:

a) Manufacturer's name or trade-mark,
b) Designation (nominal size of splines/serrations),
c) Accuracy grade,
d) Setting angle for hobbing,
e) Gash lead, and
f) No. of starts.

11 PACKING AND PACKAGING

11.1 Packaging of spline hobs shall be as per IS 10097.

11.2 Each hob or a number of hobs of same type shall be packed in a carton bearing the size, number, designation and the manufacturers name or trade-mark.

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